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Evaluating Oral Health Trends in Kentucky, 2006-2012

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EVALUATING ORAL HEALTH TRENDS IN KENTUCKY, 2006-2012

CAPSTONE PROJECT PAPER

A paper submitted in partial fulfillment of the
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By
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Introduction

Kentucky is a state known for its thoroughbred horses, fine whiskeys, bluegrass music, and unique culture. Unfortunately, Kentucky is also known as a state with copious health disparities resulting from a multitude of complex social, political, and economic issues. Oral health, a term referring to the health of the teeth and gums as well as the entire craniofacial complex, is one such complicated health disparity that affects the quality of health and overall life of Kentuckians today.

As stated by the United States surgeon general, C. Everett Koop, "You're not healthy without good oral health."[1] This statement becomes obviously true when studying the health implications of poor oral health. Caries and periodontal disease, or tooth decay and gum disease respectively, are often accompanied by edentulism—tooth loss or toothlessness. An individual with poor oral health may experience difficulty chewing and digesting food properly and therefore will have poor nutrition and overall poor health.[2] Loss of teeth may also affect a person's ability to talk and communicate properly.[2] Furthermore, tooth loss and visible cavities may have psychological effects, and can lead to lower levels of self-esteem [3], poor mental health [4], and a lesser quality of life.[5] Poor oral health has also been observed to result in difficulty obtaining and maintaining employment due to prejudices associated with the physical appearance of an individual with tooth loss as well as time lost from work for oral health-related issues.[1]

Poor oral health in adults has been noted as a risk factor associated with diabetes [1], stroke [6], coronary heart disease [7], and acute myocardial infarction.[8] Some studies have even found that poor oral health, periodontal disease specifically, is related to Alzheimer's

disease.[9] An individual's oral health status is unquestionably an integral component of general health and well-being.

Adults, children, and the elderly all experience a share of the total oral health disease burden experienced in the US. It is estimated that adults lose 164 million work hours each year due to oral health problems and dental visits.[1] For children, fifty-one million school hours are lost annually because of oral health problems, primarily those related to dental caries which occur five to eight times more frequently than the second-most common adverse health condition of asthma.[1] The prevalence of early childhood caries is noted to be very high in Kentucky compared to national studies, especially among lower socio-economic status (SES) individuals.[10] Poor children have missed three times as many days of school because of oral health issues than their more affluent peers.[11] The impact of poor oral health is far reaching. Studies report that poor oral health even affects unborn children. Mothers with poor oral health during pregnancy have an increased risk for delivering preterm and low-birth-weight babies.[12]

Ten years ago, Kentucky ranked number one for edentulism in the United States for individuals over 65 years of age. 38.1% of the elderly were toothless.[10] This subset of the population's edentulism has been linked with extremely poor quality of life. [13] For Kentuckians of all ages, studies show 26.6% have lost 6 or more teeth due to tooth decay or gum disease.[10] This percentage is extremely high compared to the 17.6% of people nationwide who have 6 or more missing teeth.[10]

Biologically, every subpopulation within the United States is susceptible to oral health disease and decay. There are numerous risk factors associated with having poor oral health, ranging from an individual's behaviors to the geographic area in which an individual resides. Oral hygiene habits, diet, and negative health behaviors such as smoking tobacco products,

which has been shown to be a leading contributor to periodontal disease, all affect oral health. [12, 14] Profound disparities exist nationwide in low SES and certain racial and ethnic minority populations.[12] These groups tend to bear a disproportionate volume of the oral health disease burden, and are less likely to receive care because of issues related to their inability to access dental health services owing to physical and economic obstacles.[12] For example, Americans without dental insurance are more likely to have unmet dental needs compared to those with insurance.[1] Several studies have detailed the lack of dental insurance coverage as one of the largest barriers to dental care.[15] Another at-risk population includes individuals living in rural areas, which tend to be classified as medically underserved. [12] Medically underserved populations, especially those with low health literacy in rural environments, are more likely to have poor oral health.[12]

In the early 2000s, Kentucky's poor, rural, alarmingly uninsured and medically underserved population was recognized as having blatant oral health disparities. This became great cause for public health action. In 2004, over 100 stakeholders involved with oral health—dentists, hygienists, public health professionals, and politicians—assembled to create a plan to combat Kentucky's poor oral health status. Kentucky's Statewide Oral Health Strategic Plan (SOHSP), *Healthy Kentucky Smiles: A Lifetime of Oral Health,* was the product of this assembly.

The SOHSP, developed in order to address and improve oral health for all age ranges in the state of Kentucky, was implemented in 2006; however, no post-implementation assessment of Kentucky's oral health has been conducted. This capstone aims to analyze the utilization of dental health services and edentulism in Kentucky during the six year period following the implementation of the SOHSP. The analysis will also focus on identifying oral health trends

among demographic subpopulations of Kentuckians: age, sex, race, education level, employment status, and income level.

I hypothesize the following:

Null and Alternative Hypotheses	
H_0 **1**	The number of individuals who've been to the dentist does not significantly correlate with the year.
H_A **1**	The number of individuals who've been to the dentist significantly correlates with the year.
H_0 **2**	The number of individuals who've had their teeth cleaned does not significantly correlate with the year.
H_A **2**	The number of individuals who've had their teeth cleaned significantly correlates with the year.
H_0 **3**	The number of individuals who've had their teeth removed does not significantly correlate with the year.
H_A **3**	The number of individuals who've had their teeth removed significantly correlates to the year.

I suspect that as the years pass, the population will increase its oral health service utilization; therefore the year and the number of individuals visiting the dentist and getting their teeth cleaned will positively correlate. I also suspect that as the years pass, the number of individuals with teeth removed due to disease and decay will decrease; therefore the year and the number of individuals with teeth removed will negatively correlate.

The remainder of this capstone will explore trends in oral health found in Kentucky, specifically the utilization of dental health services, and the population's edentulism rates, between 2006 and 2012. A literature review will provide background information pertaining to oral health, oral health disparities, and oral health strategic plans in Kentucky and across the United States. Next, the methodology of this study will explain the steps used to identify significant correlations in Kentucky's oral health service utilization and edentulism, as well as demographic-specific correlations. A results section will follow, showcasing the study's findings. Subsequently, there will be a discussion of these findings including limitations of the study. Finally, a conclusory chapter will reiterate the study's impact and results.

Literature Review

As a bio-psychosocial disease with physical and emotional affects ranging from pain and infection to impaired nutrition, impaired speech, impaired growth and development, poor self-image and confidence, and inability to learn in school, dental caries and periodontal disease have long been a subject of study in the clinical and academic settings.[12] This chapter serves as an introduction to the components leading to Kentucky's SOHSP as well as a summary of key concepts foundational to fully understanding current and past oral health research and intervention endeavors.

Improvement to oral health nationwide over the last half century can be attributed to one of the most major successes of public health in the 1900s: community water fluoridation.[1] In the 1930s, it was shown that communities with fluoridated water had less dental caries overall than those communities without fluoridated water.[1] A substantive initiative to increase water fluoridation across the country during the latter half of the 20th century has yielded a nation in which 7 out of 10 Americans receive fluoridated water through public water systems.[16] Impressively, Kentucky has the second highest rate of citizens exposed to optimally fluoridated water in the country.[10] Although fluoridated water supplies are a great first step in preventing dental caries and periodontal disease, only 60% of tooth decay in children is prevented by water fluoridation.[10] There are many other avenues that must be explored to comprehensively prevent and treat oral disease in both children and adults alike.

In addition to continuing to increase access to fluoridated water, the 21st century saw an influx of attention paid to oral health disease surveillance, treatment, and prevention. In 2000, the surgeon general's report, *Oral Health in America: A Report of the Surgeon General*, spurred a proliferation of oral health surveys and publications.[1] Oral health has often been overlooked as

a significant health issue, but the surgeon general's report helped to establish oral health as a prevalent health issue that needed attention by describing the current oral health status of Americans, the relationship between oral health and general health and well-being, oral health promotion measures, and oral disease prevention procedures.

Among other items, the report described multiple possible barriers to sufficient oral health: lack of access to care,—due to limited income, or lack of insurance—transportation issues, and flexibility to take time off from work and/or incur the expense of missed working hours in order to seek care.[1] The report also suggested that some public policy makers consider oral health and the need for care to be less important than other health needs, which can limit resources for the field of oral health.[1]

In 2003, the surgeon general followed up the 2000 report with another publication, *A National Call to Action to Promote Oral Health*. It acknowledged the previous surgeon general's report on oral health as an important document highlighting the oral health disparities present in America that called upon the nation to understand the link between oral health and general health and well-being and to take action. The 2003 report not only reiterated the primary purpose of the 2000 report, it described five actions that were essential for improving oral health across the nation: change perceptions of oral health; overcome barriers by replicating effective programs and proven efforts; build the science base and accelerate science transfer; increase oral health workforce diversity, capacity, and flexibility; and increase collaborations.[17]

Each of these action measures was accompanied by several objectives complete with actions that should be accomplished. For example, Action 1 called for a change in perceptions of oral health. This measure's objectives were to change public perceptions, change policymakers' perceptions, and change health providers' perceptions. These objectives each had multiple action

steps meant to assist in accomplishing the overall measure to achieve a change in public perception. Four actions were recommended: enhance oral health literacy; develop messages that are culturally sensitive and linguistically competent; enhance knowledge of the value of regular, professional oral health care; and increase the understanding of how the signs and symptoms of oral infections can indicate general health status and act as markers for other diseases.[17] The 2000 report established oral health as a contending healthcare issue for the US population, but specifically for vulnerable populations. The 2003 report was a call to action to help alleviate oral health disease and increase the oral health status of all Americans.

In addition to these two oral health-specific surgeon general reports, oral health was also prominently featured in *Healthy People 2010*, which included 17 objectives to be met by 2010.[18] These 17 objectives encompassed increasing dental service utilization, decreasing instances of dental caries, periodontal disease, and edentulism in all ages, increasing oral health screenings, increasing prevention methods such as application of dental sealants, increasing oral health education, and increasing oral and craniofacial state-based surveillance.[18] After reaching 2010, the 17 oral health objectives of *Healthy People 2010* were evaluated. Most of these objectives moved toward their 2010 targets, but some of the improvements were not statistically significant.[19] Successes included the fact that oral health continued to improve in the adult population and the use of dental sealants among children increased. However, disparities by race/ethnicity and education persisted for many objectives.[19]

Healthy People 2020 also has oral health-related objectives. These 17 objectives reflect the concerns of the surgeon general's reports as well as the shortcomings of *Healthy People 2010.* The updated target measures include: reducing dental caries, periodontal disease, and edentulism in all age ranges; increasing access to and utilization of dental health services (interestingly, by

increasing the proportion of school-based health centers, health departments and FQHCs with oral health components, and increasing the number of agencies that have a dental public health program directed by a dentist with public health training, on top of increasing the number of individuals with the economic and physical means to access dental health services); increasing development and use of monitoring and surveillance systems; and increasing preventive interventions in both the child and adult population.[20]

Community water fluoridation, the surgeon general's reports of the early 2000s, *Healthy People 2010*, and *Healthy People 2020* all laid the foundation for Kentucky's SOHSP by describing the national oral health disease burden, and measures that can be taken to help increase the oral health status of all citizens. The SOHSP, drafted in 2004 and implemented in 2006, builds on the same data and principles that are showcased in the above documents. Appendix 1 shows the goals of the SOHSP broken down into sub categories. Reaching the goals of the SOHSP would ensure an adequately served, well-educated population made up of communities who understand the importance of and have access to oral health prevention and wellness programs.

To produce its goals, the assembly creating the SOHSP studied the surgeon general's reports, and the *Healthy People 2010* and *2020* initiatives. The state of Kentucky also performed an analysis of its population's current oral health status to determine Kentucky's baseline statistics. In 2003, the 2001 Kentucky Children's Oral Health Profile (KCOHP), a study outsourced to the University of Kentucky College of Dentistry, was published by the Kentucky Department for Public Health.[21] In 2003, the 2002 Kentucky Adult Oral Health Survey (KAOHS), a study completed by the University of Louisville School of Dentistry, was also

published by the Kentucky Department for Public Health.[14] This benchmark data is reflected in the goals of the SOHSP.

The KCOHP eventually facilitated the SOHSP, but was originally developed as an on-going children's oral health surveillance program. Its findings were meant to serve as baseline data for *Healthy Kentucky 2010*. Over 5,600 third and sixth graders across Kentucky in both private and public schools participated in the profile. These children received a dental screening, the results of which were coupled with the answers to a questionnaire completed by the child's parent(s) that focused on additional dental, medical, and insurance information.[21]

The KCOHP showcased the oral health disease burden experienced by Kentucky's children. 12.3% of screened children had a toothache in the past month.[21] While 28.7% had untreated tooth decay at the time of screening, almost 20% hadn't been to a dentist in the past year, and over 5% had never been to a dentist at all.[21] Approximately 20% of the children had no dental insurance. These baseline numbers established Kentucky's children as a population needing critical oral health intervention.

The KAOHS also established Kentucky's adult population as one needing improved oral health status. The survey was administered via telephone to 2,066 individuals, and then generalized to Kentucky's adult population. The purpose of conducting the KAOHS was to provide a benchmark status of adult Kentuckian oral health in order to evaluate progress towards *Healthy Kentuckians 2010* goals. Furthermore, it was meant to identify problems associated with access to dental care, the utilization of dental services, and the distribution of oral disease among adult Kentuckians.

The findings of the KAOHS detailed the poor oral health status of adult Kentuckians. 24.9% of adult Kentuckians reported having oral pain within the past three months, which

disproportionately fell on the underclass.[14] 21.4% had active dental caries, and 1 in 5 reported having had six or more teeth extracted.[14] 36.1% of adult Kentuckians had not been to a dentist in the past year, and 31.7% of the lowest income group had not even made a dental visit in the past five years.[14] An overwhelming 49.6% of adult Kentuckians had no dental insurance of any kind.[14]

As exemplified by the child and adult Kentuckian oral health profiles, high rates of oral disease and edentulism coupled with low rates of dental service utilization, due in part to lack of insurance coverage, paved the way for the implementation of Kentucky's SOHSP.

Oral health literature establishes a link between oral health and general health. It describes subpopulations within the US that are vulnerable in relation to oral health. The literature also details the heightened awareness of oral health as a significant contributor of overall health and the need for oral health surveillance, prevention, treatment, and funding. Two surgeon general reports, two decades of oral health initiatives for *Healthy People*, and two oral health assessments of Kentucky's population have led to the implementation of Kentucky's SOHSP. This capstone project aims to fill a gap in existing oral health literature by determining post-SOHSP implementation oral health trends in Kentucky's adult population.

Methodology

Design

This study is quantitative in nature. It is an observational, longitudinal study that aims to analyze multiple cross-sectional datasets in order to determine correlations between statewide utilization of oral health services and edentulism, and the six year period following the implementation of the Kentucky SOHSP. These correlations were not only analyzed in terms of the total Kentucky respondents, but also in terms of participant demographic information including age, sex, race, education level, employment status, and income level.

For this study, publicly available cross-sectional BRFSS data sets were analyzed. BRFSS is an on-going, random-digit dialing telephone survey of the non-institutionalized US civilian population aged 18 and older.[22] The survey is administered to individuals who answer the phone and are willing and able to participate. Captured data becomes publicly available on the Center for Disease Control and Prevention's website, and all data is de-identified.[22] Surveys are conducted in all states and the District of Columbia by state health departments in cooperation with the CDC, with a median response rate of 51%. [22] Respondents categorize their demographic information and survey answers.

BRFSS data offers an easily accessible avenue for determining adult Kentuckian oral health status because oral health data is collected every other year. For this study, national BRFSS data was downloaded from the CDC's website. Using SAS 9.3, data from 2006, 2008, 2010, and 2012 were merged. Kentucky-specific data, demographic information of respondents, and survey results of the three oral health questions were pulled from the data set. All other data was discarded.

Data

There are two dependent variables in this study: oral health service utilization and edentulism. The former was measured with two BRFSS questions, the first of which asked participants about the last time (s)he had visited a dentist or dental clinic for any reason. Responses were coded from 1 to 5: 1 = within the past year; 2 = 1 year, but less than 2 years ago; 3 = 2 years, but less than 5 years ago; 4 = 5 or more years ago, and 5 = never. The second BRFSS question pertaining to oral health service utilization asked the respondent about the last time (s)he had his/her teeth cleaned professionally. Responses were coded the same way as the previous question: 1 = within the past year; 2 = 1 year, but less than 2 years ago; 3 = 2 years, but less than 5 years ago; 4 = 5 or more years ago, and 5 = never.

Responses to questions concerning the number of teeth removed from an individual's mouth as a result of tooth decay or gum disease were coded as the second dependent variable, edentulism. Responses were coded from 1 to 4: 1 = 1 to 5 teeth removed; 2 = 6 or more, but not all teeth removed; 3 = all teeth removed; and 4 = no teeth removed. See Appendix 2 for a list of the complete dependent variables. Missing and unknown responses were coded as 7 and 9 respectively, and were excluded from analysis.

The independent variables of this study include the year of the survey administration, age, sex, race, education level, employment status, and income level. See Appendix 3 for a list of the complete independent variables. Similarly to the dependent variable group, missing and unknown responses were coded as 7 and 9 respectively, and were excluded from analysis.

Analysis

CDC BRFSS data sets for 2006, 2008, 2010, and 2012 were merged and analyzed with SPSS version 21. Descriptive statistics and bivariate analyses were conducted on all variables. Pearson correlation coefficients were calculated as a measure of the strength and direction of the

linear relationship between each dependent and independent variable. The closer the Pearson correlation coefficient is to +1, the closer the two variables correlate positively; the closer the Pearson correlation coefficient is to -1, the closer the two variables correlate negatively. Significance levels were calculated at the .05 and the .01 levels. Microsoft Excel 2010 was then used to supplement data analysis, and produce tables and graphs.

Results

A total of 33,549 Kentuckians participated in the BRFSS survey throughout 2006, 2008, 2010, and 2012. Table 1 displays a descriptive summary of the study variables for all four years, including valid and missing sample sizes. Specifically, it shows the number of respondents per variable per response category per year. It should be noted that the second question denoting dental service utilization—pertaining to teeth cleaning—was only asked on three of the four years. These percentages, indicating the frequency of responses per question per year, show changes over time. One can look at the frequencies over the six year period to identify changes in response categories over time. For example, the percentage of respondents reporting that they had visited the dentist in the past year went from 17.3% in 2006 to 24.8% in 2008, to 23.9% in 2010, to 34% in 2012. A statistical analysis would need to be performed to determine the significance of this upward trend, but the percentages at face-value seem to indicate an increase in service utilization over time. Table 1 provides keen insight into the changes in respondent choices over time.

Figures 1-6 show aggregate independent variable data. As depicted by the demographic data, the majority of BRFSS respondents included in this study were elderly white women with a high school education, who worked for wages and earned less than $25,000 annually per household. Almost all individuals responded to the demographic questions for age, education level, and employment status, but some demographic variables had only a small number of respondent responses. For example, only 1.6% of respondents indicated their race. Low response rates for some demographic variables paint an inaccurate picture of the respondent population, making demographic analysis difficult.

Figures 7-9 display aggregate dependent variable data. Almost 60% of total responses placed respondents at the dentist in the past year, and 62% of respondents 2006-2010 had their teeth cleaned within the past year. Two-thirds of respondents were missing none or 1 to 5 teeth. These statistics identify the majority of the aggregate respondent population as high oral health service utilizers with low edentulism rates. This is exactly what one would hope to see.

In order to test the hypotheses of this study, dependent variables and independent variables were analyzed using bivariate analyses. This allows for an analysis of the correlations between service utilization and edentulism as they relate to time passing, as well as service utilization and edentulism as they relate to specific demographics in Kentucky. Table 2 displays the results of these bivariate analyses.

Multiple variables proved significantly correlated. Correlations involving the best determinants of oral health service utilization (service utilization within the past 1 year) and low rates of edentulism (no teeth removed) follow:

I. Going to the dentist within the past year was significantly correlated with being 18-24 years old (graph 1), being 45-54 years old (graph 1), being 55-64 years old (graph 1), sex (graph 2), being Asian, having some high school education (graph 3), graduating from high school (graph 3), having some college education (graph 3), graduating from college (graph 3), being employed for wages (graph 4), being self-employed (graph 4), being retired (graph 4), and earnings at all income levels (graph 5).

II. Going to have your teeth cleaned within the past year was significantly positively correlated with being 45-54 years old (graph 6), being female (graph 7), having secondary and/or post-secondary education (graph 8), being self-employed (graph 9), and being a homemaker (graph 9).

III. Having zero teeth removed was significantly correlated with being 45-54 years old (graph 10), being 55-64 years old (graph 10), sex (graph 11), being Asian, having some high school education (graph 12), graduating from high school (graph 12), having some college education (graph 12), graduating from college (graph 12), being employed for wages (graph 13), being self-employed (graph 13), being a student (graph 13), being retired (graph 13), and earnings at all income levels (graph 14).

Discussion

The main purpose of this study was to determine correlations between oral health service utilization, edentulism, and the year after the implementation of the SOHSP in 2006 in order to observe any correlations over time. To do this, correlations between utilization of oral health services and the year, as well as edentulism and the year were calculated. One would expect to find significant correlations between the two service-use dependent variables and the year, and edentulism and the year, as it would potentially describe a changing environment in which the population's oral health was being affected for the better by the implementation of the SOHSP. The bivariate analyses indicated that only the number of individuals who have visited the dentist 5 years or more ago significantly correlated with the year. Therefore, I reject $H_0$1 and by default accept H_A1. The number of individuals who have been to the dentist in the past 5 or more years significantly correlates with the year. However, this finding establishes a decrease in service utilization during the post-SOHSP implementation period. If an increased number of individuals have gone to the dentist in the past 5 or more years, this indicates that a decreased number of individuals have gone to the dentist in general which speaks to a decline in oral health service utilization.

Because there were no significant correlations between the second service utilization variable (teeth cleaning) and the year, and edentulism and the year, I fail to reject both $H_0$2 and $H_0$3. Teeth cleanings—another measure for dental service utilization—did not correlate with the year. Oral disease burden—measured as edentulism—did not correlate with the year either. Between 2006 and 2012, no significant correlations in teeth cleaning or edentulism over time were present.

Even though testing the three hypotheses was the major focus of this study, identifying oral health trends among demographic subpopulations of Kentuckian respondents was also a focus. The bivariate analyses indicated multiple positive correlations between utilization of oral health services and demographic variables, as well as positive correlations between edentulism and demographic variables.

Respondents 45-54 years old and 55-64 years old were the age ranges most highly correlated with oral health service utilization and lower edentulism rates.

Men and women were strongly correlated with both service utilization and low edentulism rates. However, women were significantly correlated with more service utilization rates, meaning that women use more dental health services. This is compatible with women's utilization of medical services. [23]

Race was not strongly correlated with service utilization or edentulism, save for Asian respondents. Whites significantly correlated with visiting the dentist 5 or more years ago, and blacks significantly correlated with visiting the dentist 1-2 years ago. Asians however, significantly correlated with both service utilization measures (dental visits and teeth cleanings) and low endentulism rates. This outcome could be driven by the extremely small sample size of Asian respondents, and not necessarily because the Asian race and dependent variables are actually significantly correlated.

It is surprising that there are not negative correlations between minority groups and the dependent variables because minority individuals with lower SES typically have greater barriers to accessing care.[12] It is interesting to note that "Hispanic" was not included as a race for respondents to choose from. Instead, Hispanic was listed in a different BRFSS question about ethnicity. Kentucky's Hispanic population has increased rapidly in the past decade, and it

continues to increase.[24] It would be interesting to factor ethnicity into this study because it would allow analysis of service utilization and oral health disease burden in one of Kentucky's fastest growing demographic groups.

As touted in multiple studies, education makes people healthy.[25] The link is not quite fully understood, but the relationship may have something to do with the modified behaviors of educated people. Individuals with higher educational achievements may be more informed, more knowledgeable, or better able to understand information about a health issue or topic. More highly educated persons may have better job opportunities leading them to make more money, and thus more able to seek, utilize, and pay for preventive health care services and insurance. Furthermore, an individual's actions are influenced by the factors surrounding him or her. If an individual with an education who has a high-paying job lives with, works with, or is friends with, a similar person, a cultural norm for being more health conscious may exist. There are numerous possibilities for why and how the link between education and health exists, but this study seems to confirm the notion.

As the education levels of the respondents increase, the strength of the correlations between education level and service utilization, and education level and lower rates of edentulism increases. Graphs 3, 8, and 12 depict service utilization and edentulism by level of education. The highest frequency of dental visits in the past year, teeth cleanings in the past year, and individuals with zero teeth removed are experienced by the most educated demographic, college graduates. The lowest frequency of dental visits within the past year, teeth cleanings in the past year, and individuals with zero teeth removed are experienced by the least educated demographic, individuals who have completed some high school. High school graduates and

respondents who have had some college coursework experience the second lowest and second highest frequencies of service utilization within the past year and no edentulism, respectively.

Several different types of employment status are significantly correlated with both dependent variables. As one would expect, respondents employed for wages are significantly correlated with visiting a dentist in the past year. Also, this employment status is significantly correlated with zero teeth removed. One would expect this because individuals employed for wages are the most likely group to have dental insurance. Self-employed respondents were significantly correlated with both dependent variables, which is interesting because this group of employees wouldn't necessarily have insurance. As noted earlier, lack of dental insurance has been found to be a significant barrier to accessing dental health care.[15] Perhaps the self-employed individuals are high-income earners, and can afford to utilize dental health services without insurance. There is a similar finding with homemakers who were significantly correlated with getting their teeth cleaned in the past year. Perhaps homemakers, who are able to stay at home because their spouse earns a high income, can seek preventive dental services covered by their spouse's insurance. Another group of interest is the student population. They too have recently gone to the dentist and have significantly low edentulism rates—another example of the link between education and being healthier.

A surprising result from these analyses includes the retired respondent population's significant correlations with service utilization and low edentulism rates. One would expect retired individuals to not receive adequate dental care because Medicare does not pay for it, and approximately one-fifth of Kentuckians are Medicare patients. One would think this would drive the Medicare-using population—retiree-aged persons—to not seek treatment. However,

retirement significantly correlates with high rates of utilization of dental services, and low rates of edentulism.

All income ranges significantly correlate with dental visits. However, respondents whose households make $50,000 or more per year significantly correlate with low rates of teeth cleaning. One would expect that individuals earning larger sums of money would be able to afford and be interested in receiving preventive services like teeth cleanings, but respondents in these income brackets significantly correlated with getting their teeth cleaned in the past 2-5 years, 5 or more years ago, and never. People can be deterred from utilizing health services for a number of reasons. Perhaps the cost of dental services has risen, and respondent salaries have not.

Even though each income level significantly correlated with one or more of the dependent variables, a hierarchy can be observed when examining the frequencies of service utilization and edentulism by income level. Graphs 5, 14, and 15 depict these frequencies. The group with the highest earnings experienced the highest frequency of dental visits in the past year, teeth cleanings in the past year, and individuals with zero teeth removed. As the amount of money earned annually decreases, the frequency of visits, cleanings, and zero teeth removed decreases. The lowest frequency of dental visits within the past year, teeth cleanings in the past year, and individuals with zero teeth removed are experienced by the lowest income level.

Limitations

This study has several limitations and delimitations. Although BRFSS data yields externally valid results, there are inherent limitations present. Certain groups are excluded from or underrepresented in telephone surveys such as BRFSS: specifically, people who do not have a telephone in the household; people who are difficult to contact because of the hours they are near

their telephone; and those who refuse to participate. Furthermore, BRFSS data, and this study's results, are completely dependent upon the accuracy of self-reported data. Any reporting bias on behalf of the interviewed individual may skew the results.

Another limitation of this study is the restricted observation time of the 6 years following the implementation of the policy. Data prior to the implementation of the SOHSP was not analyzed. It could be possible that correlations among service utilization and edentulism, and the year were already occurring before the policy was implemented, but this study only looks at correlations post-policy implementation. A final limitation of this study pertains to the fact that correlation is not causation. There are too many omitted variables and external factors present in the scope of the study to definitively state that the observed correlations between oral health service utilization and edentulism, and time post-SOHSP implementation are solely due to the implementation of the policy.

This study has a few inherent delimitations. While the study population is large—about 33,500 individuals over the six year period—data was only collected for four of the six years; oral health related questions were only asked of BRFSS participants on even years. Furthermore, the data analyzed for this study was inconsistent for those four years. During 2006, 2008, and 2010, three oral health-related questions were asked to survey participants. During 2012, only two of these questions were asked to individuals.

The next delimitation that should be noted is that this study did not generalize its results to the entire Kentucky population; it only captures data of the approximate 33,500 participants over the 6 year period—the population of which seems to be skewed towards older white women. In this study oral health correlations were calculated for Kentucky survey respondents, not for all Kentuckians. Another delimitation of this study pertains to the BRFSS data used.

Because only individuals at or over the age of 18 can participate, the analyzed oral health trends only describe the adult and elderly respondent population in Kentucky, which excludes Kentucky's vulnerable child population.

Conclusion

Bivariate analyses of Kentucky BRFSS data specific to oral health and demographic variables of interest for a 6 year period after the implementation of statewide policy to increase oral health status among Kentuckians yielded results certifying that over time, utilization of oral health services, specifically going to the dentist more than five years ago, was significantly correlated with the year. However, getting one's teeth cleaned and edentulism rates did not correlate with the year. For the six year period following the implementation of Kentucky's SOHSP, this study attests that correlations between oral health service use and edentulism, and the year did not show any changes in service utilization apart from an overall decrease in going to the dentist. Many correlations between service utilization and edentulism among demographic categories of respondents were established.

Demographic variables show that individuals between the ages of 45-55, individuals who are women, Asian persons, individuals with higher levels of education, persons employed for wages or self-employed, and individuals at all income levels, among others, are significantly correlated with oral health service utilization and edentulism.

Correlations between demographic groups and the dependent variables established in this study could be examined further in future studies to better understand the dynamics between service utilization and edentulism, and demographic variables. For example, determining why a specific demographic group is significantly correlated with visiting a dentist in the past year would be step forward in comprehending the impact of the SOHSP or determining future policy.

Because this study does not provide evidence of changing oral health trends in the time period following implementation of the SOHSP, I recommend that the Kentucky Department of Public Health work with the University of Louisville School of Dentistry and the University of Kentucky College of Dentistry to perform a current analysis of Kentucky's oral health status.

The analyses completed in 2003 provided baseline oral health statistics for Kentucky's child and adult populations. A current analysis of child and adult oral health must to be performed in order to determine Kentucky's current oral health statistics. Once there are numbers to compare 2003 rates to, one will be able to assess the usefulness and impact of the SOHSP. This study assesses whether or not correlations exist between oral health service utilization and edentulism, and the years following the implementation of the SOHSP, but comparing current oral health statistics with 2003 baseline statistics will offer a broader view of oral health trends pre- and post-SOHSP implementation.

Even with the presence of the limitations and delimitations described previously, this study is able to provide information relevant to current and past oral health service consumption and edentulism rates.

Oral health, the health of the teeth, gums, and craniofacial complex, is made up of a number of complex factors including individual behaviors, socioeconomic status, geographic isolation, access to education, care, and dental insurance, demographics, and cultural influences. Oral health is a significant component of overall health that affects people physically, mentally, and socially. Kentucky has taken great strides over the years to increase its citizens' oral health, but more work must be done to fully realize the impacts of its current SOHSP.

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Appendix

1. Goals of Kentucky's Statewide Oral Health Strategic Plan

Appendix 1. Goals of Kentucky's Statewide Oral Health Strategic Plan		
Sub-Planning Committee	**Goal No.**	**Goal Description**
Advocacy	1.0	Develop and administer government policy and programs that address oral health as a full component of overall health for eligible populations.
	2.0	Elevate the importance of oral health in the public discourse about health status in Kentucky.
Economic Development	3.0	Communicate that good oral health has economic value.
	4.0	Communicate that dentistry is a business and has economic impact on communities.
	5.0	Build communities with high quality health infrastructures to attract and retain employers.
	6.0	Increase the number of dental professionals to underserved areas to assure access to care.
Funding	7.0	Increase available funding for oral health to increase access to care.
Partnerships and Collaboration	8.0	To solicit, develop and nurture relationships with other organizations and associations to expand awareness of and expand the focus on oral health.
	9.0	To assist dental professionals to recognize signs of domestic violence observed in their patients, and to implement policies and procedures to reduce this burden on both patients and providers.
Prevention and Treatment	10.0	Provide lifelong maintenance of oral wellness through coordinated, integrated, and comprehensive services.
Public Health Education	11.0	Increase oral health wellness through education and disease prevention.
	12.0	Increase oral health wellness through coordinated state-wide educational activities.
	13.0	Increase oral health wellness through coordinated state-wide media.
School-Based Coordination	14.0	Assure that all children receive regular dental education and care as a part of an integrated program.
Workforce	15.0	Assess the past, present and future status of the dental workforce in Kentucky and develop a work-plan to address identified needs.
	16.0	To increase collaboration with and between dental professionals and other medical professionals in Kentucky.

2. Oral Health BRFSS Questions and Potential Responses

Appendix 2. Oral Health BRFSS Questions and Potential Responses		
Dependent Variable = Oral Health Service Utilization	1. How long has it been since you last visited a dentist or a dental clinic for any reason? Include visits to dental specialists such as orthodontists.	
	A	Within the past year (anytime less than 12 months ago)
	B	Within the past 2 years (1 year but less than 2 years ago)
	C	Within the past 5 years (2 years but less than 5 years ago)
	D	5 or more years ago
	E	Never
	2. How long has it been since you had your teeth cleaned by a dentist or dental hygienist?	
	A	Within the past year (anytime less than 12 months ago)
	B	Within the past 2 years (1 year but less than 2 years ago)
	C	Within the past 5 years (2 years but less than 5 years ago)
	D	5 or more years ago
	E	Never
Dependent Variable = Edentulism	3. How many of your permanent teeth have been removed because of tooth decay or gum disease? Include teeth lost to infection, but do not include teeth lost for other reasons, such as injury or orthodontics. (If wisdom teeth are removed because of tooth decay or gum disease, they should be included in the count for lost teeth.)	
	A	1 to 5
	B	6 or more, but not all
	C	All
	D	None

3. Independent Variables

Appendix 3. Independent Variables						
Year of BRFSS Admin.	**Age**	**Sex**	**Race**	**Education Level**	**Employment Status**	**Annual Household Income Level**
2006	18-24	Male	White	Never Attended	Employed for Wages	Less than $25,000
2008	25-34	Female	Black	Elementary	Self-Employed	Less than $50,000, but more than $25,000
2010	35-44		Asian	Some High School	Out of Work for More than 1 Year	Less than $75,000, but more than $50,000
2012	45-54		Native Hawaiian	High School Grad	Out of Work for Less than 1 Year	More than $75,000
	55-64		American Indian/Alaska Native	Some College	Homemaker	
	65+		Other	College Grad	Student	
					Retired	
					Unable to Work	

4. Figures

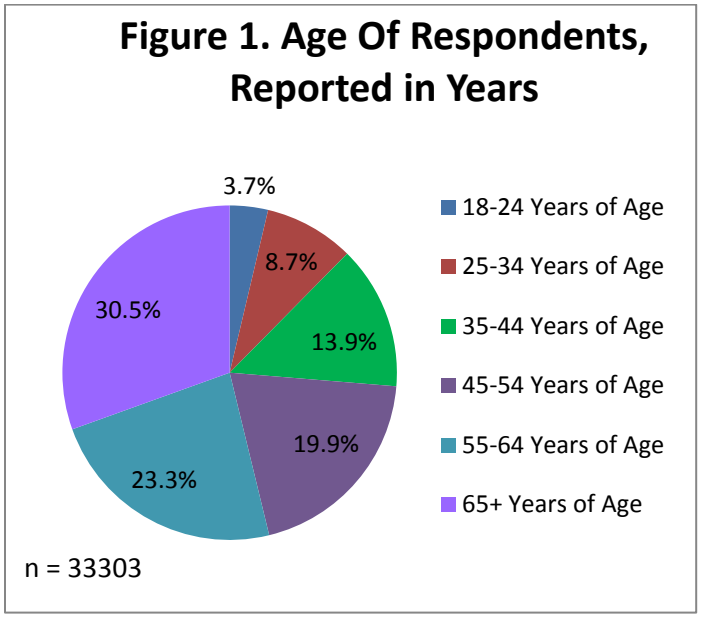


Figure 1. Age Of Respondents, Reported in Years
3.7%
8.7%
13.9%
19.9%
23.3%
30.5%
18-24 Years of Age
25-34 Years of Age
35-44 Years of Age
45-54 Years of Age
55-64 Years of Age
65+ Years of Age
n = 33303

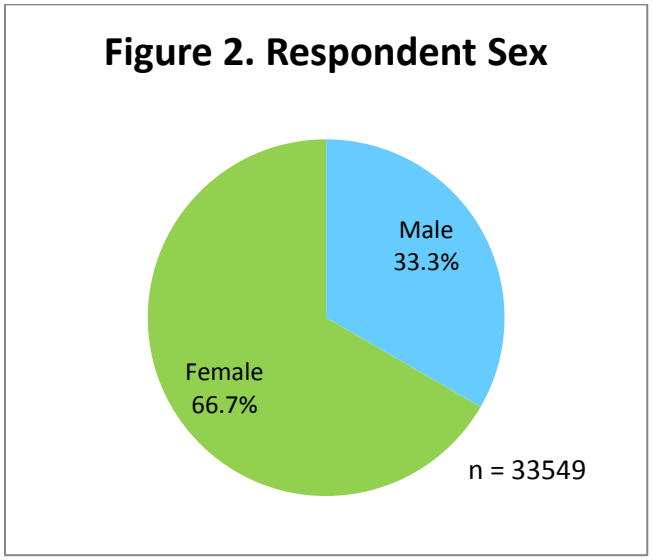


Figure 2. Respondent Sex
Male
33.3%
Female
66.7%
n = 33549

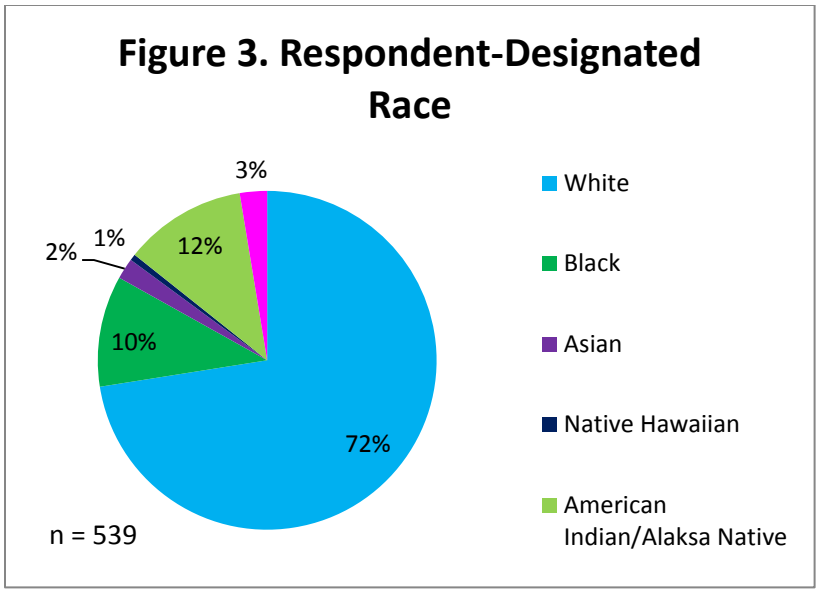


Figure 3. Respondent-Designated Race
3%
2%
1%
12%
10%
72%
n = 539
White
Black
Asian
Native Hawaiian
American Indian/Alaksa Native

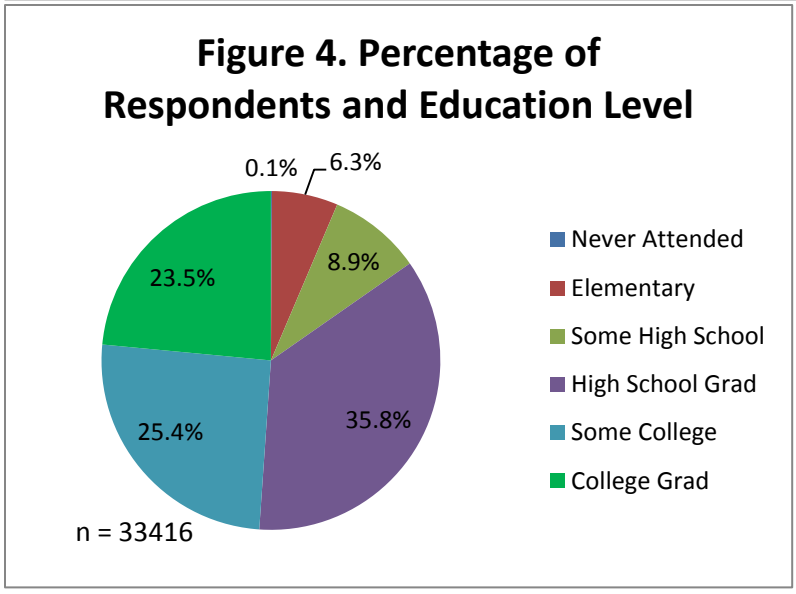
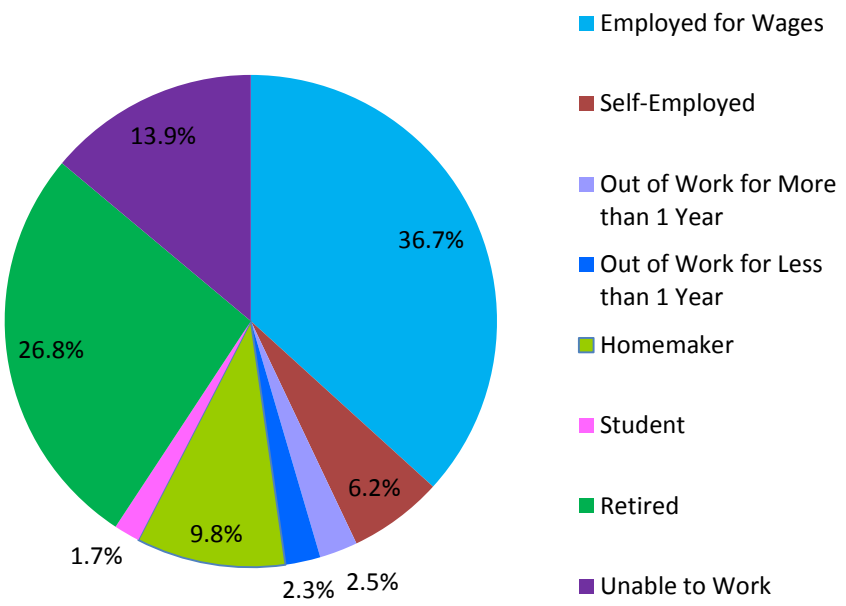


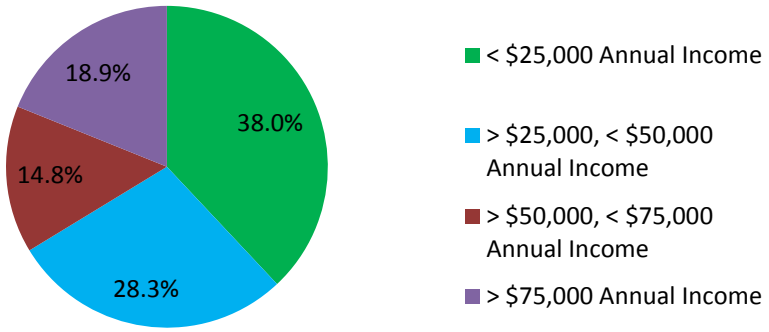
Figure 4. Percentage of Respondents and Education Level
0.1%
6.3%
8.9%
23.5%
35.8%
25.4%
n = 33416
Never Attended
Elementary
Some High School
High School Grad
Some College
College Grad

Figure 5. Percentage of Respondents and Employment Status



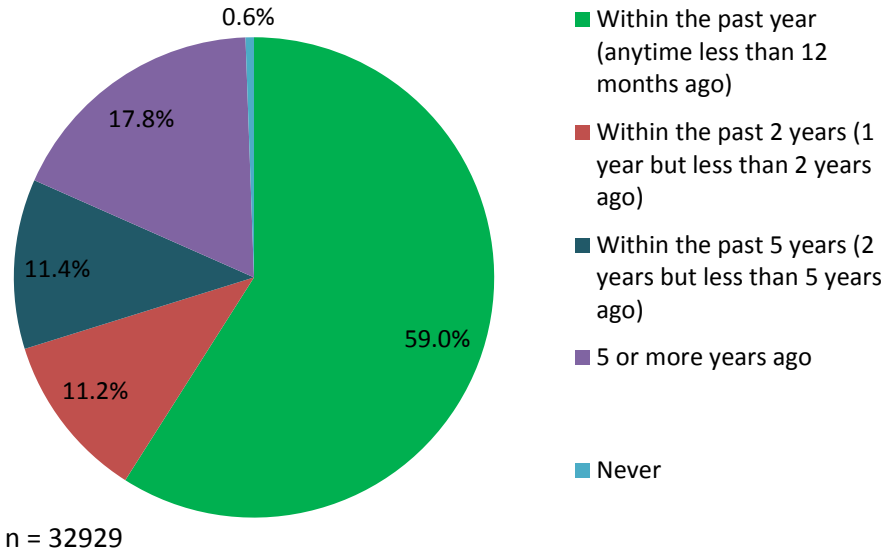
n = 33376

Figure 6. Percentage of Respondents and Income Level



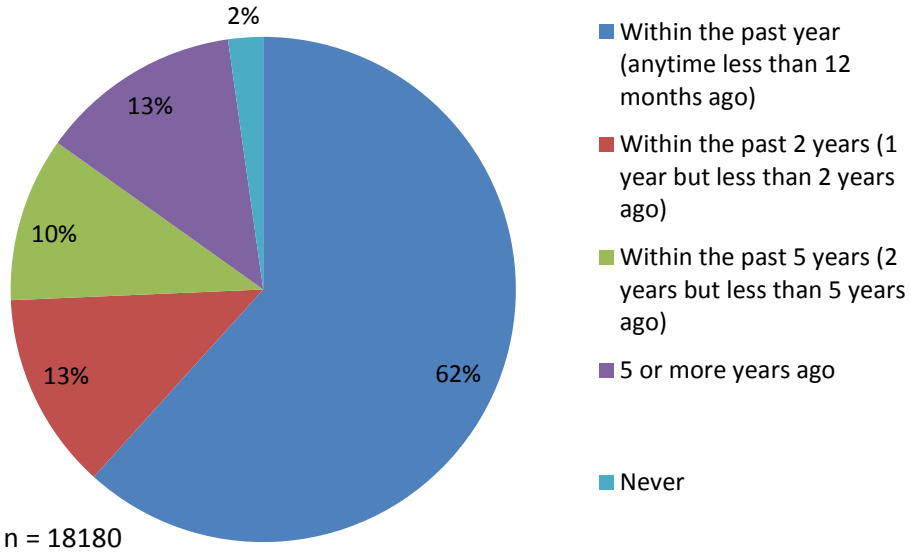
n = 28843

Figure 7. Last Visit to Dentist or Dental Clinic, 2006-2012



n = 32929

Figure 8. Teeth Last Cleaned by Dentist or Dental Hygienist, 2006-2010



n = 18180

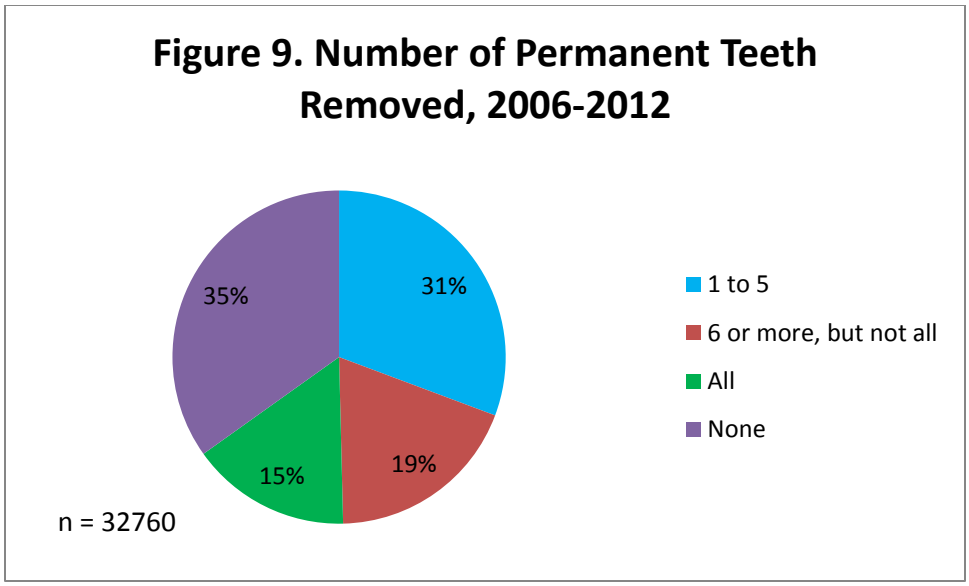


Figure 9. Number of Permanent Teeth Removed, 2006-2012
31%
19%
15%
35%
1 to 5
6 or more, but not all
All
None
n = 32760

5. Tables

Table 1. Descriptive Summary of Study Variables, Total BRFSS Sample 2006-2012 (N = 33549)						
Last Visit to Dentist or Dental Clinic			Valid		Missing	
			N Total	(%)	N Total	(%)
			32929	98.20%	620	1.80%
		2006	**2008**	**2010**	**2012**	**Total**
Within the past year (anytime less than 12 months ago)	N	3368	4825	4635	6601	19429
	%	17.3%	24.8%	23.9%	34.0%	100.0%
Within the past 2 years (1 year but less than 2 years ago)	N	762	831	879	1212	3684
	%	20.7%	22.6%	23.9%	32.9%	100.0%
Within the past 5 years (2 years but less than 5 years ago)	N	600	972	948	1246	3766
	%	15.9%	25.8%	25.2%	33.1%	100.0%
5 or more years ago	N	1066	1387	1491	1920	5864
	%	18.2%	23.7%	25.4%	32.7%	100.0%
Never	N	62	44	29	51	186
	%	33.3%	23.7%	15.6%	27.4%	100.0%
Total	N	5858	8059	7982	11030	32929
	%	17.8%	24.5%	24.2%	33.5%	100.0%
When Teeth Last Cleaned by Dentist of Hygienist *			Valid		Missing	
			N Total	(%)	N Total	(%)
			18180	54.20%	15369	45.80%
		2006	**2008**	**2010**	**2012**	**Total**
Within the past year (anytime less than 12 months ago)	N	2917	4203	4097	-	11217
	%	26.0%	37.5%	36.5%	-	100.0%
Within the past 2 years (1 year but less than 2 years ago)	N	674	814	807	-	2295
	%	29.4%	35.5%	35.2%	-	100.0%
Within the past 5 years (2 years but less than 5 years ago)	N	427	771	717	-	1915
	%	22.3%	40.3%	37.4%	-	100.0%
5 or more years ago	N	542	946	859	-	2347
	%	23.1%	40.3%	36.6%	-	100.0%
Never	N	104	157	145	-	406
	%	25.6%	38.7%	35.7%	-	100.0%
Total	N	4664	6891	6625	-	18180
	%	25.7%	37.9%	36.4%	-	100.0%
Number of Permanent Teeth Removed			Valid		Missing	
			N Total	(%)	N Total	(%)
			32760	97.60%	789	2.40%
		2006	**2008**	**2010**	**2012**	**Total**
1 to 5	N	1726	2495	2444	3390	10055
	%	17.2%	24.8%	24.3%	33.7%	100.0%

	N	1092	1582	1580	1944	6198
6 or more, but not all	%	17.6%	25.5%	25.5%	31.4%	100.0%
	N	1299	1122	1307	1357	5085
All	%	25.5%	22.1%	25.7%	26.7%	100.0%
	N	1901	2784	2589	4148	11422
None	%	16.6%	24.4%	22.7%	36.3%	100.0%
	N	6018	7983	7920	10839	32760
Total	%	18.4%	24.4%	24.2%	33.1%	100.0%

Age Reported in Years			Valid		Missing	
			N Total	(%)	N Total	(%)
			33303	99.30%	246	0.70%
		2006	**2008**	**2010**	**2012**	**Total**
	N	230	229	229	517	1205
18-24	%	19.1%	19.0%	19.0%	42.9%	100.0%
	N	624	695	559	986	2904
25-34	%	21.5%	23.9%	19.2%	34.0%	100.0%
	N	1000	1236	1014	1394	4644
35-44	%	21.5%	26.6%	21.8%	30.0%	100.0%
	N	1260	1599	1575	2148	6582
45-54	%	19.1%	24.3%	23.9%	32.6%	100.0%
	N	1325	1878	1924	2652	7779
55-64	%	17.0%	24.1%	24.7%	34.1%	100.0%
	N	1711	2392	2659	3427	10189
65+	%	16.8%	23.5%	26.1%	33.6%	100.0%
	N	6150	8029	8000	11124	33303
Total	%	18.5%	24.1%	24.0%	33.4%	100.0%

Sex			Valid		Missing	
			N Total	(%)	N Total	(%)
			33549	100.00%	0	0.00%
		2006	**2008**	**2010**	**2012**	**Total**
	N	2020	2614	2554	3998	11186
Male	%	18.1%	23.4%	22.8%	35.7%	100.0%
	N	4154	5477	5507	7225	22363
Female	%	18.6%	24.5%	24.6%	32.3%	100.0%
	N	6174	8091	8061	11223	33549
Total	%	18.4%	24.1%	24.0%	33.5%	100.0%

Respondent Race Choice			Valid		Missing	
			N Total	(%)	N Total	(%)
			539	1.60%	33010	98.40%
		2006	**2008**	**2010**	**2012**	**Total**
	N	37	70	119	165	391
White	%	9.5%	17.9%	30.4%	42.2%	100.0%

	N	6	6	11	34	57
Black	%	10.5%	10.5%	19.3%	59.6%	100.0%
	N	0	2	3	6	11
Asian	%	0.0%	18.2%	27.3%	54.5%	100.0%
	N	1	0	1	1	3
Native Hawaiian	%	33.3%	0.0%	33.3%	33.3%	100.0%
	N	6	10	20	27	63
American Indian/Alaska Native	%	9.5%	15.9%	31.7%	42.9%	100.0%
	N	3	2	5	4	14
Other	%	21.4%	14.3%	35.7%	28.6%	100.0%
	N	53	90	159	237	539
Total	%	9.8%	16.7%	29.5%	44.0%	100.0%

Education Level			Valid		Missing	
			N Total	(%)	N Total	(%)
			33416	99.60%	133	0.40%
		2006	**2008**	**2010**	**2012**	**Total**
	N	18	7	6	5	36
Never Attended	%	50.0%	19.4%	16.7%	13.9%	100.0%
	N	540	512	487	560	2099
Elementary	%	25.7%	244.4%	23.2%	26.7%	100.0%
	N	683	714	735	853	2985
Some High School	%	22.9%	23.9%	24.6%	28.6%	100.0%
	N	2248	2841	2942	3917	11948
High School Grad	%	18.8%	23.8%	24.6%	32.8%	100.0%
	N	1447	2060	1990	2993	8490
Some College	%	17.0%	24.3%	23.4%	353.0%	100.0%
	N	1220	1936	1863	2839	7858
College Grad	%	16	25	24	36	100
	N	6156	8070	8023	11167	33416
Total	%	18.4%	24.2%	24.0%	33.4%	100.0%

Employment Status			Valid		Missing	
			N Total	(%)	N Total	(%)
			33376	99.50%	173	.5%
		2006	**2008**	**2010**	**2012**	**Total**
	N	2261	3127	2679	4190	12257
Employed for Wages	%	18.4%	25.5%	21.9%	34.2%	100.0%
	N	333	539	507	702	2081
Self-Employed	%	16.0%	25.9%	24.4%	33.7%	100.0%
	N	107	182	238	311	838
Out of Work for More than 1 Year	%	12.8%	21.7%	28.4%	37.1%	100.0%
	N	110	197	212	265	784
Out of Work for Less than 1 Year	%	14.0%	25.1%	27.0%	33.8%	100.0%
Homemaker	N	610	870	859	935	3274

	%	18.6%	26.6%	26.2%	28.6%	100.0%
	N	93	124	110	235	562
Student	%	16.5%	22.1%	19.6%	41.8%	100.0%
	N	1704	2046	2248	2953	8951
Retired	%	19.0%	22.9%	25.1%	33.0%	100.0%
	N	945	976	1164	1544	4629
Unable to Work	%	20.4%	21.1%	25.1%	33.4%	100.0%
	N	6163	8061	8017	11135	33376
Total	%	18.5%	24.2%	24.0%	33.4%	100.0%

Annual Income Level per Household per Year			Valid		Missing	
			N Total	(%)	N Total	(%)
			28843	86.00%	4706	14.00%
		2006	**2008**	**2010**	**2012**	**Total**
	N	1989	2580	2760	365	10981
Less than $25,000	%	18.1%	23.5%	25.1%	33.3%	100.0%
	N	1375	2118	1900	2751	8144
Less than $50,000, but more than $25,000	%	16.9%	26.0%	23.3%	33.8%	100.0%
	N	706	1113	1034	1425	4278
Less than $75,000, but more than $50,000	%	16.5%	26.0%	24.2%	33.3%	100.0%
	N	1775	1452	1310	1903	5440
More than $75,000	%	14.2%	26.7%	24.1%	35.0%	100.0%
	N	4845	7263	7004	9731	28843
Total	%	16.8%	25.2%	24.3%	33.7%	100.0%

* Data only collected in 2006, 2008, & 2010

Table 2. Bivariate Analyses of All Variables

Key:
Pearson Correlation
Significance Level
* Correlation is significant at the .05 level (2-tailed)
**Correlation is significant at the .01 level (2-tailed)

		Last Dental Visit					Last Teeth Cleaning					Teeth Removed			
		Within the Past Year (anytime less than 12 months ago)	Within the Past 2 Years (1 year but less than 2 years ago)	Within the Past 5 Years (2 years but less than 5 years ago)	5 or More Years Ago	Never	Within the Past Year (anytime less than 12 months ago)	Within the Past 2 Years (1 year but less than 2 years ago)	Within the Past 5 Years (2 years but less than 5 years ago)	5 or More Years Ago	Never	1 to 5	6 or More, But Not All	All	None
Year	2006-2012	**.923**	**.903**	**.933**	**.976***	**-.448**	**.827**	**.843**	**.784**	**.745**	**.738**	**.936**	**.943**	**.451**	**.898**
		.077	*.097*	*.067*	*.024*	*.552*	*.381*	*.362*	*.427*	*.464*	*.472*	*.064*	*.057*	*.549*	*.102*
Age	18-24	**.875**	**.971***	**.768**	**.859**	**.217**	**.563**	**.538**	**.621**	**.667**	**.675**	**.860**	**.755**	**.552**	**.918**
		.125	*.029*	*.232*	*.141*	*.783*	*.619*	*.638*	*.573*	*.536*	*.528*	*.140*	*.245*	*.448*	*.082*
	25-34	**.893**	**.921**	**.797**	**.830**	**.259**	**.386**	**.358**	**.451**	**.503**	**.513**	**.871**	**.771**	**.347**	**.933**
		.107	*.079*	*.203*	*.170*	*.741*	*.748*	*.767*	*.702*	*.664*	*.657*	*.129*	*.229*	*.653*	*.067*
	35-44	**-.468**	**-.721**	**-.338**	**-.542**	**-.261**	**.693**	**.671**	**.743**	**.782**	**.789**	**.877**	**.827**	**-.041**	**.910**
		.532	*.279*	*.662*	*.458*	*.739*	*.512*	*.531*	*.466*	*.428*	*.421*	*.123*	*.173*	*.959*	*.090*
	45-54	**.966***	**.990****	**.924**	**.985***	**-.164**	**1.000****	**.999***	**.998***	**.992**	**.991**	**.996****	**.964***	**.304**	**.998****
		.034	*.010*	*.076*	*.015*	*.836*	*.004*	*.023*	*.042*	*.080*	*.087*	*.004*	*.036*	*.696*	*.002*
	55-64	**.991****	**.951***	**.981***	**.999****	**-.289**	**.995**	**.998***	**.985**	**.974**	**.971**	**.998****	**.985***	**.291**	**.983***
		.009	*.049*	*.019*	*.001*	*.711*	*.063*	*.044*	*.109*	*.147*	*.154*	*.002*	*.015*	*.709*	*.017*
	65+	**.888**	**.981***	**.819**	**.927**	**-.064**	**.985**	**.990**	**.971**	**.955**	**.951**	**.977***	**.984***	**.330**	**.943**
		.112	*.019*	*.181*	*.073*	*.936*	*.109*	*.090*	*.155*	*.193*	*.200*	*.023*	*.016*	*.670*	*.057*
Sex	Male	**.990***	**.982***	**.945**	**.975***	**-.090**	**.996**	**.993**	**1.000***	**.999***	**.999***	**.978***	**.924**	**.373**	**.996****
		.010	*.018*	*.055*	*.025*	*.910*	*.058*	*.077*	*.012*	*.025*	*.033*	*.022*	*.076*	*.627*	*.004*
	Female	**.995****	**.928**	**.994****	**.990****	**-.303**	**1.000****	**.999***	**.998***	**.993**	**.991**	**.999****	**.990***	**.259**	**.982***
		.005	*.072*	*.006*	*.010*	*.697*	*.006*	*.025*	*.039*	*.077*	*.085*	*.001*	*.010*	*.741*	*.018*
Race	White	**.910**	**.915**	**.909**	**.969***	**-.410**	**.770**	**.788**	**.722**	**.679**	**.671**	**.927**	**.923**	**.512**	**.896**
		.090	*.085*	*.091*	*.031*	*.590*	*.441*	*.422*	*.487*	*.525*	*.532*	*.073*	*.077*	*.488*	*.104*
	Black	**.894**	**.990***	**.806**	**.907**	**.069**	**.705**	**.726**	**.652**	**.606**	**.597**	**.884**	**.798**	**.626**	**.923**

Table 2. Bivariate Analyses of All Variables

Key: **Pearson Correlation** *Significance Level* * Correlation is significant at the .05 level (2-tailed) **Correlation is significant at the .01 level (2-tailed)		Last Dental Visit					Last Teeth Cleaning					Teeth Removed			
		Within the Past Year (anytime less than 12 months ago)	Within the Past 2 Years (1 year but less than 2 years ago)	Within the Past 5 Years (2 years but less than 5 years ago)	5 or More Years Ago	Never	Within the Past Year (anytime less than 12 months ago)	Within the Past 2 Years (1 year but less than 2 years ago)	Within the Past 5 Years (2 years but less than 5 years ago)	5 or More Years Ago	Never	1 to 5	6 or More, But Not All	All	None
		.106	*.010*	*.194*	*.093*	*.931*	*.502*	*.483*	*.548*	*.586*	*.593*	*.116*	*.202*	*.374*	*.077*
	Asian	**.975***	**.961***	**.961***	**.999****	**-.294**	**.918**	**.929**	**.887**	**.858**	**.852**	**.980***	**.962***	**.419**	**.965***
		.025	*.039*	*.039*	*.001*	*.706*	*.260*	*.241*	*.306*	*.343*	*.351*	*.020*	*.038*	*.581*	*.035*
	Native Hawaiian	**.016**	**.300**	**-.077**	**.149**	**.121**	**-.563**	**-.538**	**-.621**	**-.667**	**-.675**	**.018**	**-.062**	**.968***	**.051**
		.984	*.700*	*.923*	*.851*	*.879*	*.619*	*.638*	*.573*	*.536*	*.528*	*.982*	*.938*	*.032*	*.949*
	American Indian or Alaska Native	**.877**	**.903**	**.872**	**.949**	**-.406**	**.777**	**.796**	**.730**	**.688**	**.680**	**.881**	**.880**	**.574**	**.845**
		.123	*.097*	*.128*	*.051*	*.594*	*.433*	*.414*	*.479*	*.517*	*.524*	*.119*	*.120*	*.426*	*.155*
	Other	**.258**	**.384**	**.280**	**.427**	**-.523**	**-.074**	**-.044**	**-.146**	**-.205**	**-.216**	**.286**	**.312**	**.770**	**.228**
		.742	*.616*	*.720*	*.573*	*.477*	*.953*	*.972*	*.907*	*.869*	*.861*	*.714*	*.688*	*.230*	*.772*
Education Level	Never Attended	**-.868**	**-.710**	**-.946**	**-.887**	**.651**	**-.827**	**-.843**	**-.784**	**-.745**	**-.738**	**-.845**	**-.927**	**-.012**	**-.760**
		.132	*.290*	*.054*	*.113*	*.349*	*.381*	*.362*	*.427*	*.464*	*.472*	*.155*	*.073*	*.988*	*.240*
	Elementary	**.935**	**.820**	**.919**	**.858**	**-.070**	**.864**	**.849**	**.898**	**.923**	**.927**	**.287**	**.118**	**.286**	**.422**
		.065	*.180*	*.081*	*.142*	*.930*	*.336*	*.355*	*.290*	*.252*	*.244*	*.713*	*.882*	*.714*	*.578*
	Some High School	**.991****	**.954***	**.980***	**.999****	**-.280**	**.959**	**.950**	**.977**	**.988**	**.989**	**.973***	**.935**	**.471**	**.974***
		.009	*.046*	*.020*	*.001*	*.720*	*.184*	*.203*	*.138*	*.100*	*.093*	*.027*	*.065*	*.529*	*.026*
	High School Grad	**.995****	**.954***	**.982***	**.997****	**-.266**	**.997***	**.999***	**.989**	**.978**	**.976**	**.995****	**.973***	**.345**	**.987***
		.005	*.046*	*.018*	*.003*	*.734*	*.050*	*.031*	*.096*	*.134*	*.141*	*.005*	*.027*	*.655*	*.013*
	Some College	**.999****	**.962***	**.973***	**.984***	**-.173**	**.997***	**.994**	**1.000****	**.999***	**.998***	**.997****	**.968***	**.282**	**.997****
		.001	*.038*	*.027*	*.016*	*.827*	*.050*	*.069*	*.004*	*.034*	*.042*	*.003*	*.032*	*.718*	*.003*
	College Grad	**1.000****	**.948**	**.983***	**.986***	**-.217**	**.999***	**.997***	**1.000***	**.996**	**.995**	**.999****	**.977***	**.260**	**.994****
		.000	*.052*	*.017*	*.014*	*.783*	*.029*	*.048*	*.017*	*.055*	*.062*	*.001*	*.023*	*.740*	*.006*

Table 2. Bivariate Analyses of All Variables

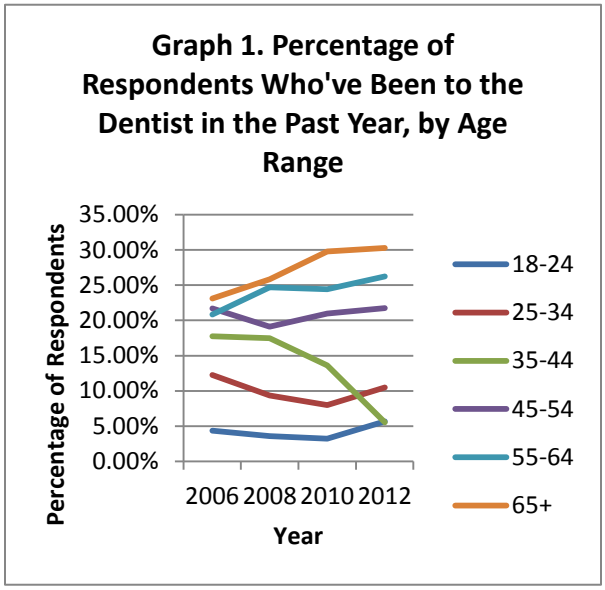
Key:
Pearson Correlation
Significance Level
* Correlation is significant at the .05 level (2-tailed)
**Correlation is significant at the .01 level (2-tailed)

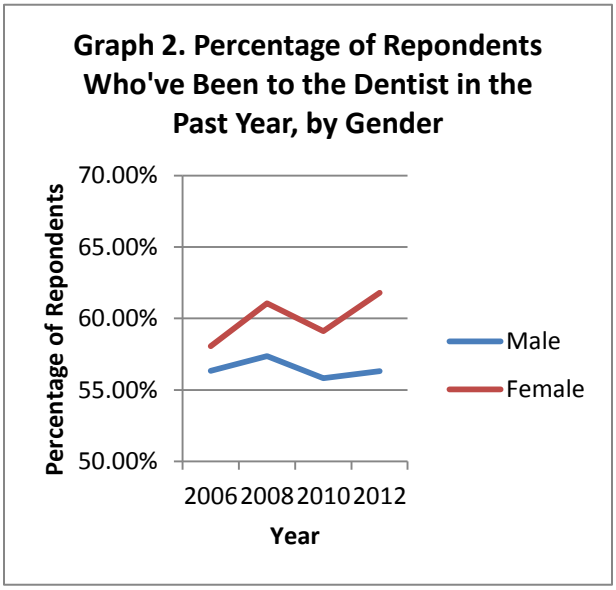
		Last Dental Visit					Last Teeth Cleaning					Teeth Removed			
		Within the Past Year (anytime less than 12 months ago)	Within the Past 2 Years (1 year but less than 2 years ago)	Within the Past 5 Years (2 years but less than 5 years ago)	5 or More Years Ago	Never	Within the Past Year (anytime less than 12 months ago)	Within the Past 2 Years (1 year but less than 2 years ago)	Within the Past 5 Years (2 years but less than 5 years ago)	5 or More Years Ago	Never	1 to 5	6 or More, But Not All	All	None
Employment Status	Employed for Wages	.981*	.932	.941	.933	-.040	.907	.894	.935	.954	.958	.969*	.923	.185	.989*
		.019	*.068*	*.059*	*.067*	*.960*	*.277*	*.296*	*.231*	*.193*	*.186*	*.031*	*.077*	*.815*	*.011*
	Self Employed	.988*	.891	.998**	.970*	-.315	.998*	.996	1.000**	.998*	.997	.992**	.994**	.143	.970*
		.012	*.109*	*.002*	*.030*	*.685*	*.039*	*.058*	*.007*	*.045*	*.052*	*.008*	*.006*	*.857*	*.030*
	Out of Work for More than 1 Year	.939	.903	.953*	.983*	-.450	.838	.854	.797	.759	.752	.948	.959*	.400	.907
		.061	*.097*	*.047*	*.017*	*.550*	*.367*	*.348*	*.413*	*.451*	*.459*	*.052*	*.041*	*.600*	*.093*
	Out of Work for Less than 1 Year	.948	.842	.987*	.964*	-.506	.983	.988	.967	.950	.947	.965*	.994**	.189	.917
		.052	*.158*	*.013*	*.036*	*.494*	*.117*	*.098*	*.163*	*.201*	*.209*	*.035*	*.006*	*.811*	*.083*
	Homemaker	.855	.672	.938	.858	-.638	1.000*	.998*	.999*	.994	.993	.863	.938	-.109	.788
		.145	*.328*	*.062*	*.142*	*.362*	*.017*	*.036*	*.029*	*.067*	*.074*	*.137*	*.062*	*.891*	*.212*
	Student	.948	.981*	.869	.919	.097	.922	.910	.948	.965	.968	.938	.860	.403	.977*
		.052	*.019*	*.131*	*.081*	*.903*	*.253*	*.272*	*.207*	*.169*	*.161*	*.062*	*.140*	*.597*	*.023*
	Retired	.981*	.962*	.965*	.999**	-.283	.982	.987	.966	.949	.945	.979*	.955*	.437	.967*
		.019	*.038*	*.035*	*.001*	*.717*	*.121*	*.102*	*.167*	*.205*	*.212*	*.021*	*.045*	*.563*	*.033*
	Unable to Work	.946	.978*	.910	.981*	-.221	.872	.887	.835	.801	.794	.911	.860	.631	.918
		.054	*.022*	*.090*	*.019*	*.779*	*.325*	*.306*	*.371*	*.409*	*.416*	*.089*	*.140*	*.369*	*.082*
Income Level (Annually per household)	<$25K	.987*	.943	.983*	.999**	-.319	.988	.992	.974	.959	.956	.990**	.974*	.367	.975*
		.013	*.057*	*.017*	*.001*	*.681*	*.098*	*.079*	*.144*	*.182*	*.190*	*.010*	*.026*	*.633*	*.025*
	<$50K	.992**	.904	.986*	.959*	-.224	.971	.964	.986	.994	.995	.991**	.979*	.131	.982*
		.008	*.096*	*.014*	*.041*	*.776*	*.153*	*.172*	*.107*	*.069*	*.062*	*.009*	*.021*	*.869*	*.018*
	<$75K	.989*	.891	.996**	.967*	-.299	.989	.984	.997*	1.000*	1.000**	.991**	.991**	.128	.972*

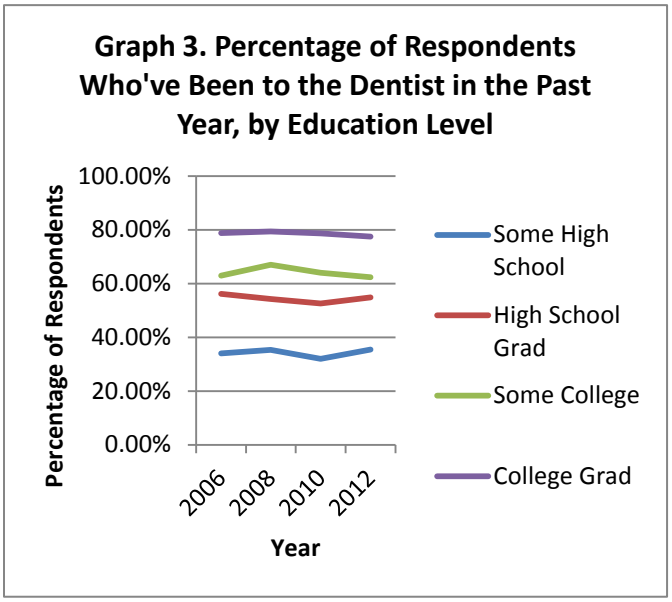
Table 2. Bivariate Analyses of All Variables

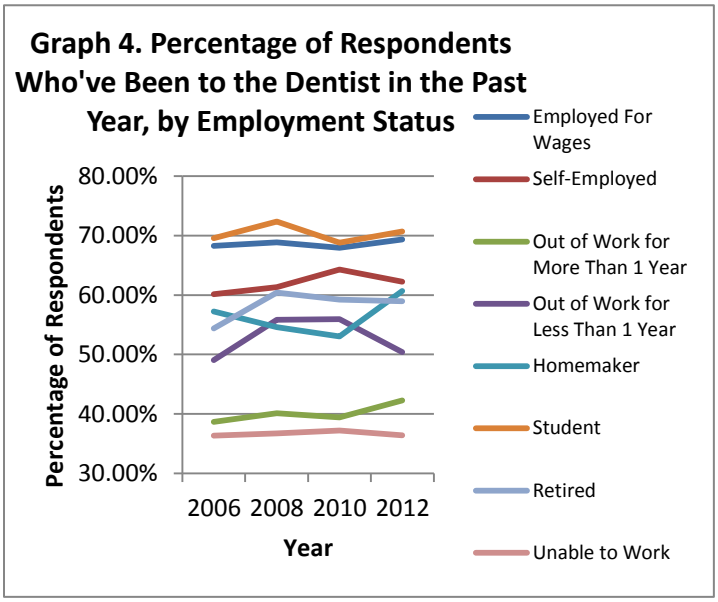
Key: **Pearson Correlation** *Significance Level* * Correlation is significant at the .05 level (2-tailed) **Correlation is significant at the .01 level (2-tailed)		Last Dental Visit					Last Teeth Cleaning					Teeth Removed			
		Within the Past Year (anytime less than 12 months ago)	Within the Past 2 Years (1 year but less than 2 years ago)	Within the Past 5 Years (2 years but less than 5 years ago)	5 or More Years Ago	Never	Within the Past Year (anytime less than 12 months ago)	Within the Past 2 Years (1 year but less than 2 years ago)	Within the Past 5 Years (2 years but less than 5 years ago)	5 or More Years Ago	Never	1 to 5	6 or More, But Not All	All	None
		.011	*.109*	*.004*	*.033*	*.701*	*.095*	*.114*	*.049*	*.011*	*.004*	*.009*	*.009*	*.872*	*.028*
	>$75K	**.984***	**.877**	**.996****	**.960***	**-.315**	**.993**	**.989**	**.999***	**1.000****	**1.000***	**.986***	**.991****	**.094**	**.962***
		.016	*.123*	*.004*	*.040*	*.685*	*.076*	*.095*	*.030*	*.008*	*.015*	*.014*	*.009*	*.906*	*.038*

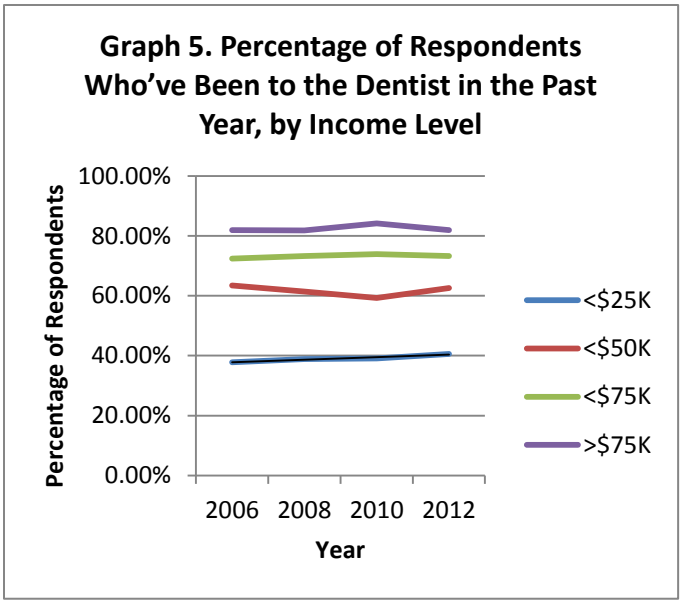
6. Graphs

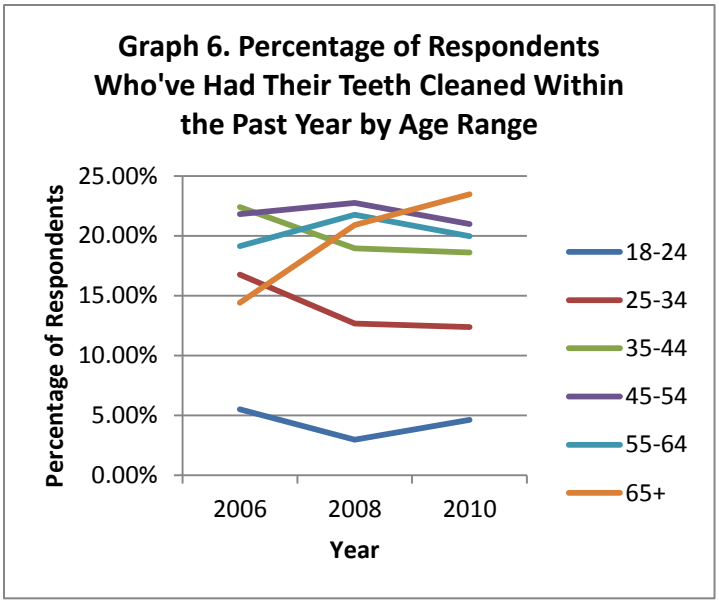

Graph 1. Percentage of Respondents Who've Been to the Dentist in the Past Year, by Age Range
Percentage of Respondents
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
2006 2008 2010 2012
Year
18-24
25-34
35-44
45-54
55-64
65+


Graph 2. Percentage of Repondents Who've Been to the Dentist in the Past Year, by Gender
Percentage of Repondents
70.00%
65.00%
60.00%
55.00%
50.00%
2006 2008 2010 2012
Year
Male
Female

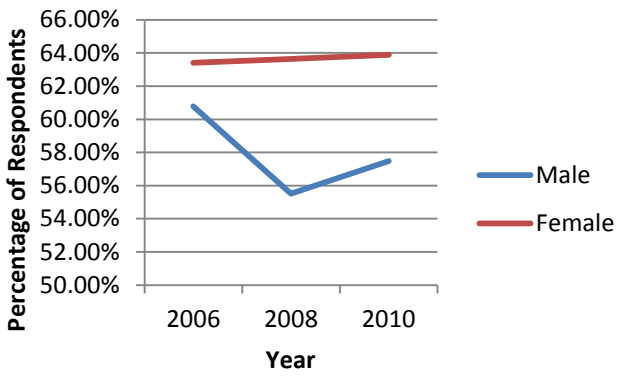

Graph 3. Percentage of Respondents Who've Been to the Dentist in the Past Year, by Education Level
Percentage of Respondents
100.00%
80.00%
60.00%
40.00%
20.00%
0.00%
2006
2008
2010
2012
Year
Some High School
High School Grad
Some College
College Grad


Graph 4. Percentage of Respondents Who've Been to the Dentist in the Past Year, by Employment Status
Percentage of Respondents
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
2006 2008 2010 2012
Year
Employed For Wages
Self-Employed
Out of Work for More Than 1 Year
Out of Work for Less Than 1 Year
Homemaker
Student
Retired
Unable to Work

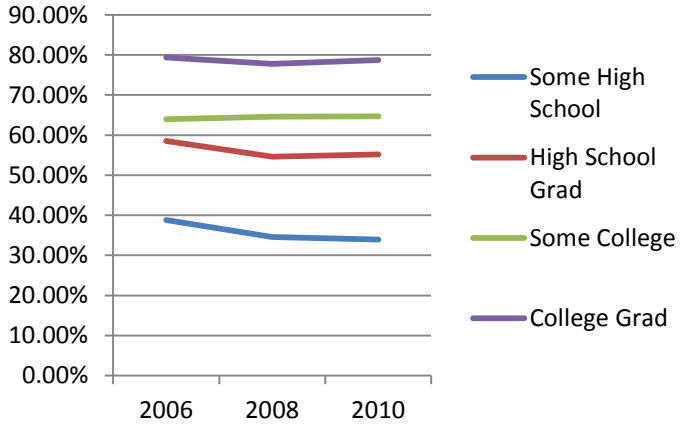

Graph 5. Percentage of Respondents Who've Been to the Dentist in the Past Year, by Income Level
Percentage of Respondents
100.00%
80.00%
60.00%
40.00%
20.00%
0.00%
2006 2008 2010 2012
Year
<$25K
<$50K
<$75K
>$75K


Graph 6. Percentage of Respondents Who've Had Their Teeth Cleaned Within the Past Year by Age Range
Percentage of Respondents
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
2006
2008
2010
Year
18-24
25-34
35-44
45-54
55-64
65+

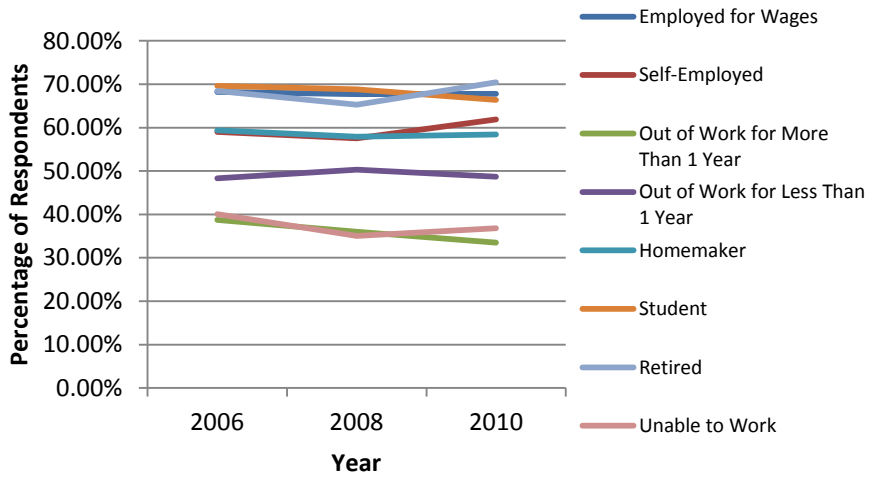
Graph 7. Percentage of Respondents Who've Had Their Teeth Cleaned in the Past Year, by Gender



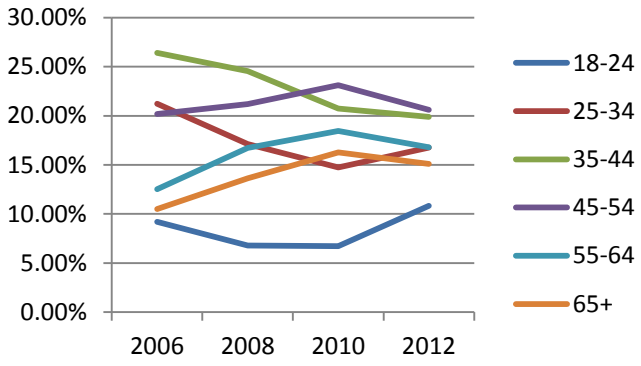
Graph 8. Percentage of Respondents Who've Had Their Teeth Cleaned in the Past Year, by Education Level



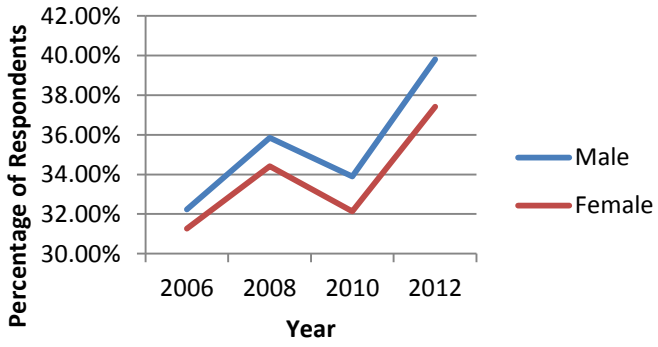
Graph 9. Percentage of Respondents Who've Had Their Teeth Cleaned in the Past Year, by Employment Status

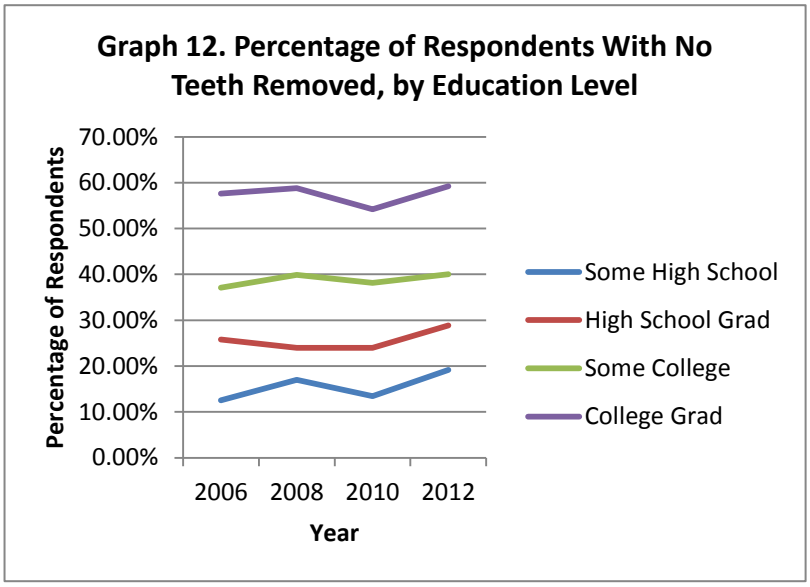


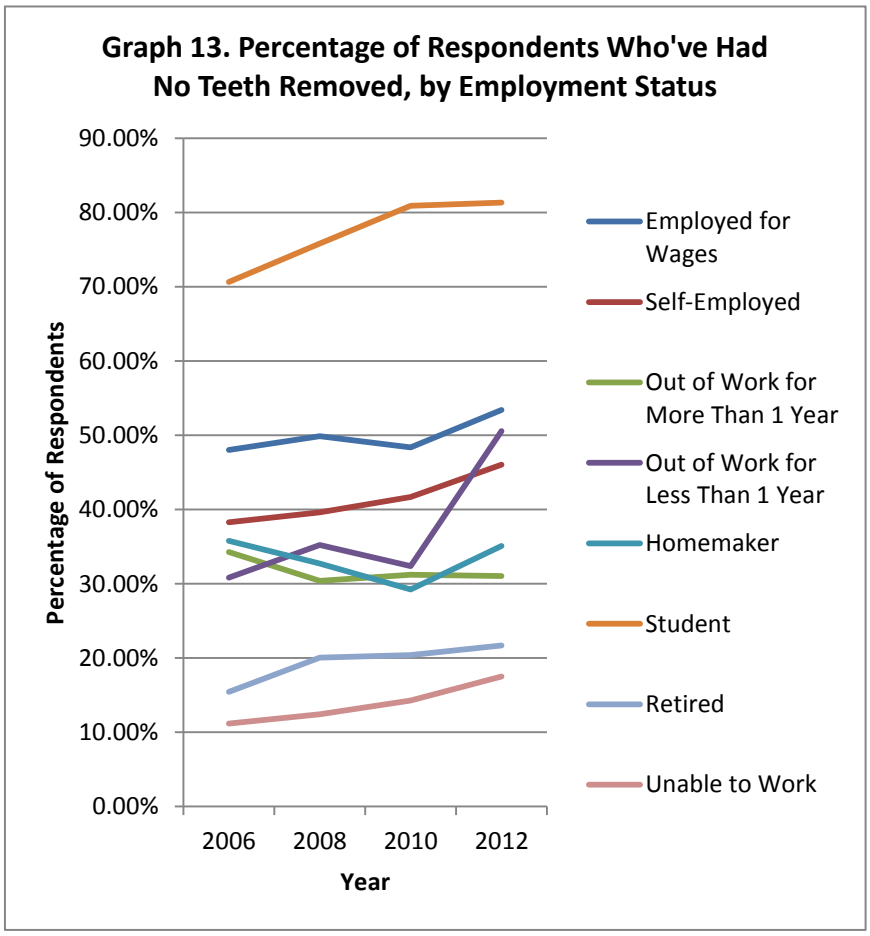
Graph 10. Percentage of Respondents Who Have Had No Teeth Removed by Age Range

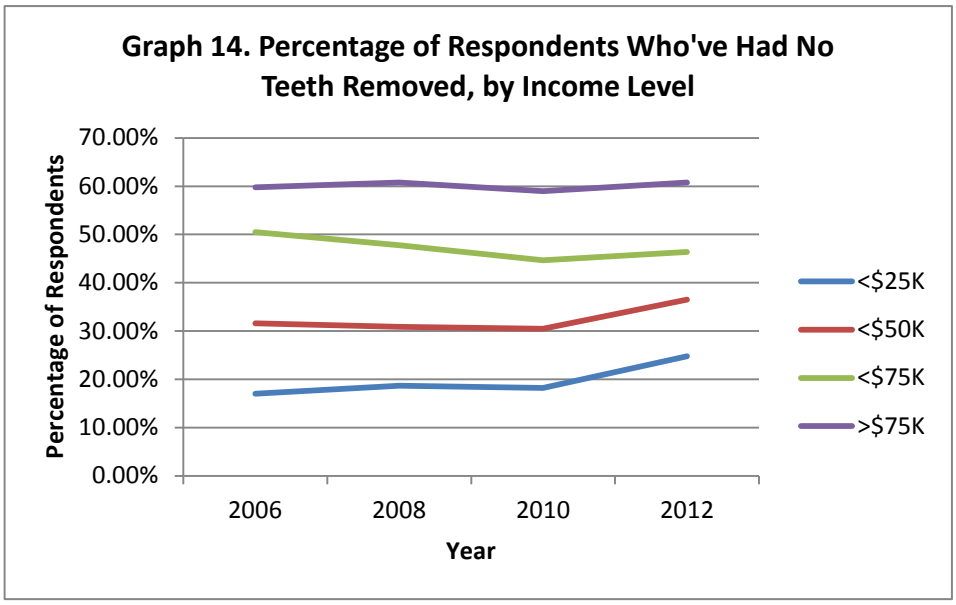


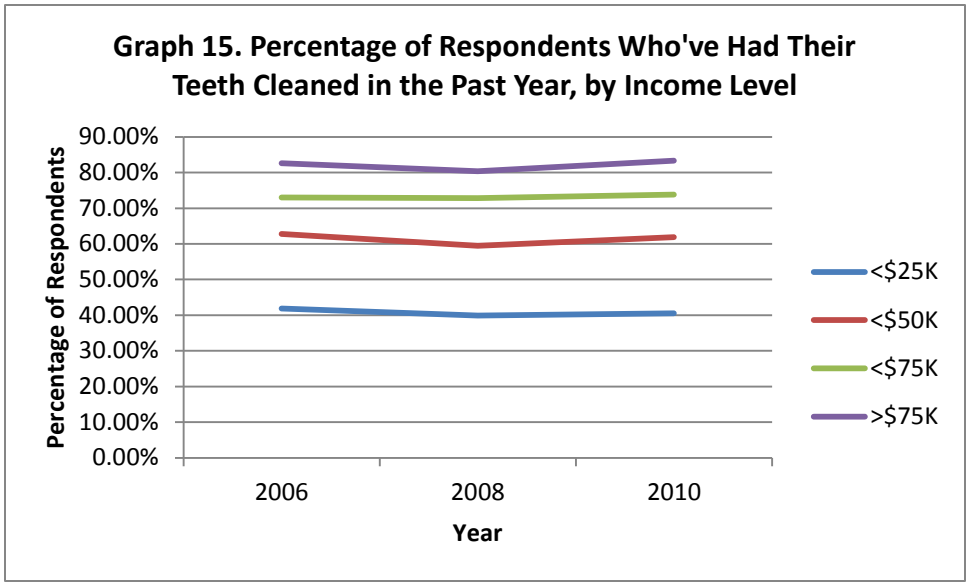
Graph 11. Percentage of Respondents Who've Had No Teeth Removed, by Gender




Graph 12. Percentage of Respondents With No Teeth Removed, by Education Level
Percentage of Respondents
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
2006
2008
2010
2012
Year
Some High School
High School Grad
Some College
College Grad


Graph 13. Percentage of Respondents Who've Had No Teeth Removed, by Employment Status
Percentage of Respondents
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
2006
2008
2010
2012
Year
Employed for Wages
Self-Employed
Out of Work for More Than 1 Year
Out of Work for Less Than 1 Year
Homemaker
Student
Retired
Unable to Work


Graph 14. Percentage of Respondents Who've Had No Teeth Removed, by Income Level
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Percentage of Respondents
2006
2008
2010
2012
Year
<$25K
<$50K
<$75K
>$75K


Graph 15. Percentage of Respondents Who've Had Their Teeth Cleaned in the Past Year, by Income Level
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Percentage of Respondents
2006
2008
2010
Year
<$25K
<$50K
<$75K
>$75K